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OF THE  
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OF  
**CIVIL ENGINEERS**



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# BOSTON SOCIETY OF CIVIL ENGINEERS

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3 Hamilton Pl., - BOSTON, MASS.

Vol. II

OCTOBER, 1915

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**BOSTON SOCIETY OF CIVIL ENGINEERS**

FOUNDED 1848

## **PROCEEDINGS**

### **NOTICE OF REGULAR MEETING.**

A REGULAR meeting of the Boston Society of Civil Engineers will be held on

**WEDNESDAY, OCTOBER 20, 1915,**

at 7.45 o'clock P.M., in CHIPMAN HALL, TREMONT TEMPLE, BOSTON.

Mr. William S. Johnson, Sanitary and Hydraulic Engineer, will read a paper entitled, "The Water Supply of Salem, Mass." Lantern slides will be used to illustrate the paper.

S. E. TINKHAM, *Secretary.*

### **PAPERS IN THIS NUMBER.**

"The Federal Valuation of the Boston and Maine Railroad,"  
F. C. Shepherd. (To be presented November 17, 1915.)  
Memoirs of Deceased Members.

Reprints from this publication, which is copyrighted, may be made provided full credit is given to the author and the Society.

Contributors are hereby notified that proof will not be submitted to them for examination unless requested before the 10th of the month preceding the month of publication.

## MINUTES OF MEETINGS.

BOSTON, MASS., September 15, 1915. — A regular meeting of the Boston Society of Civil Engineers was held this evening at Chipman Hall, Tremont Temple, and was called to order at 8 o'clock by the President, Charles R. Gow. There were 35 members and visitors present.

By vote the reading of the record of the June meeting was waived, and the record as printed in the September JOURNAL was approved.

The Secretary presented the reports of committees appointed to prepare memoirs as follows: Memoir of Benjamin G. Fogg, committee, Messrs. Leslie H. Allen and J. Arthur Garrod; Memoir of Isaac Rich, committee, Messrs. George T. Sampson, Frank B. Rowell and Theodore P. Perkins; and memoir of Past President Alexis H. French, committee, Messrs. Henry F. Bryant and Edward W. Howe. By vote the several memoirs were accepted and ordered to be printed in the JOURNAL.

The Secretary reported the election to membership of Messrs. Madison Mott Cannon, Frederic Elwin Everett, Samuel H. Pitcher and Edward Owen Strong in the grade of member.

The President announced the death of Past President Dexter Brackett, which occurred on August 26, 1915. By vote the President was requested to appoint a committee to prepare a memoir. The President has appointed as that committee, Messrs. Frederic P. Stearns and Charles W. Sherman.

The President then introduced Mr. M. J. Lorente, civil engineer, who read a paper entitled, "Some Special Methods of Reinforced Concrete Design." The paper was printed in the September, 1915, number of the JOURNAL. The paper was discussed in a written paper prepared by Mr. W. W. Clifford and C. H. Mangold, and in a communication from Mr. J. R. Worcester, which was read by the Secretary. Mr. Hiram B. Andrews also read a discussion prepared by himself. Brief verbal discussions were offered by Mr. John R. Nichols and by the author of the paper.

Adjourned.

S. E. TINKHAM, *Secretary*.



## APPLICATIONS FOR MEMBERSHIP.

[October 5, 1915.]

THE By-Laws provide that the Board of Government shall consider applications for membership with reference to the eligibility of each candidate for admission and shall determine the proper grade of membership to which he is entitled.

The Board must depend largely upon the members of the Society for the information which will enable it to arrive at a just conclusion. Every member is therefore urged to communicate promptly any facts in relation to the personal character or professional reputation and experience of the candidates which will assist the Board in its consideration. Communications relating to applicants are considered by the Board as strictly confidential.

The fact that applicants give the names of certain members as reference does not necessarily mean that such members endorse the candidate.

The Board of Government will not consider applications until the expiration of twenty (20) days from the date given.

BURLEIGH, WILLARD GILE, Waverley, Mass. (Age 21, b. Malden, Mass.) Received technical education in Malden High School, scientific course, 1913, and from buildings course at Lowell Inst., 1915. From July, 1912, to Dec., 1914, time, stock and cost data clerk, computer, etc., with H. P. Converse & Co.; from April, 1915, to date, with B. & A. R. R., office of assistant valuation engineer, as chainman and rodman. Refers to W. M. Bailey, E. P. Bliss, H. W. Hayward, W. H. Lawrence and C. E. Morrow.

KENDALL, THEODORE REED, Boston, Mass. (Age 25, b. Boston, Mass.) Received degree of S.B. from Harvard College, 1912, and degree of M.C.E. from Harvard Graduate School of Applied Science, 1914. Is temporarily employed by Prof. George C. Whipple. Refers to G. S. Deming, H. J. Hughes, L. J. Johnson, J. R. Nichols, G. F. Swain and G. C. Whipple.

NASH, SAMUEL AUBIN, Brookline, Mass. (Age 32, b. Brookline, Mass.) Student for two years at Mass. Inst. of Technology and graduate of Lowell Inst., 1908. From 1909 to 1911, with the N. Y. C. & St. L. R. R., Cleveland, Ohio, as chainman, rodman, etc.; from 1911 to 1912, concrete inspector with Tuscaloosa Mineral R. R., Tuscaloosa, Ala.; from 1912 to date, inspector for Engrg. Dept., town of Brookline; during this time has also served as inspector of building construction for Swift & Co., Syracuse, N. Y., and instrumentman for Metcalf & Eddy, Hopedale. Refers to H. P. Eddy, F. A. Leavitt, H. A. Varney and J. P. Wentworth.

## BOSTON SOCIETY OF CIVIL ENGINEERS.

STENBERG, THORNTON RICE, Worcester, Mass. (Age 20, b. Worcester, Mass.) Junior at Worcester Polytechnic Institute. Refers to Frederic Bonnet, Jr., B. A. Gibson, I. N. Hollis, H. C. Ives, E. H. Rockwell and G. C. Whipple.

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**LIST OF MEMBERS.**
**ADDITIONS.**

BRYANT, CHAUNCEY D.....189 Bellevue St., Newton, Mass.  
DEVINE, WALTER A.....Town Hall, Brookline, Mass.

**CHANGES IN ADDRESS.**

ALBEE, EDWARD E.....130 Melrose St., Melrose Highlands, Mass.  
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SKINNER, FENWICK F....21 Park Row, Park Row Building, New York, N. Y.  
TURNER, CHARLES C.....25 Beacon St., Portland, Me.

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**EMPLOYMENT BUREAU.**

THE Board of Government maintains an employment bureau for the Society, to be a medium for securing positions for its members and applicants for membership, and also for furnishing employees to members and others desiring men capable of filling responsible positions.

At the Society room two lists are kept on file, one of *positions available* and the other of *men available*, giving in each case detailed information in relation thereto.

**MEN AVAILABLE.**

328. Age 32. Received technical education at Lowell Inst. Has had seven years' experience in mechanical engineering, including machine

design and power plant and electrical work; two years' experience in railroad work; eight months on reinforced concrete; and two years as salesman. Desires position on reinforced concrete detailing or as salesman. Salary desired, \$18 per week.

329. Age 23. Graduate of Mass. Inst. of Technology, 1914, civil engineering course. Experience consists of four months as building inspector with American Tel. & Tel. Co., and fourteen months with U. S. Coast and Geodetic Survey on hydrography, leveling, plotting, etc. Desires position with railroad contractor or consulting engineer. Salary desired, \$75 per month.

330. Age 20. High school education. Has had some experience as rodman, timekeeper and cost data clerk. Desires position as rodman or timekeeper. Salary desired, \$12 per week.

## LIBRARY NOTES.

### RECENT ADDITIONS TO THE LIBRARY.

#### U. S. Government Reports.

Anticlinal Structure in Parts of Cotton and Jefferson Counties, Oklahoma. Carroll H. Wegemann.

Production of Barytes in 1914. James M. Hill.

Production of Chromic Iron Ore in 1914. J. S. Diller.

Construction and Maintenance of Roads and Bridges, July 1, 1913, to December 31, 1914.

Contributions to Economic Geology, 1913: Part II. — Mineral Fuels.

Eocene Glacial Deposits in Southwestern Colorado. Wallace W. Atwood.

Fauna of Batesville Sandstone of Northern Arkansas. George H. Girty.

Production of Fuller's Earth in 1914. Jefferson Middleton.

Fuel Briquetting in 1914. Edward W. Parker.

Geology and Mineral Deposits of National Mining District, Nevada. Waldemar Lindgren.

Geology and Mineral Resources of Kenai Penisular, Alaska. G. C. Martin, B. L. Johnson and U. S. Grant.

Life History of Shortleaf Pine. Wilbur R. Mattoon.

Production of Mica in 1914. Douglas B. Sterrett.



Potash Salts, 1914. W. C. Phalen.

Production of Phosphate Rock in 1914. W. C. Phalen.

Relation of Cretaceous Formations to Rocky Mountains in Colorado and New Mexico. Willis T. Lee.

Recovery of Secondary Metals in 1914. J. P. Dunlop.

Results of Spirit Leveling in Iowa, 1896 to 1913, inclusive.

R. B. Marshall.

Production of Talc and Soapstone in 1914. J. S. Diller.

(The) Use Book: Manual for Users of National Forests.

Wire-drag Work on Atlantic Coast. N. H. Heck and J. H. Hawley.

### County Reports.

Essex County, N. J. Report of Olmsted Brothers on Proposed Parkway System. Gift of J. C. Olmsted.

### Municipal Reports.

Chicago, Ill. Report to Real Estate Board on Disposal of Sewage and Protection of Water Supply. George A. Soper, John D. Watson and Arthur J. Martin.

Erie, Pa. Annual Report of Commissioners of Water Works for 1914.

### Miscellaneous.

American Society for Testing Materials: Year-Book for 1915.

Berger Mfg. Co.: Concrete Reinforcing and Furring Plates. Builders Iron Foundry: (The) Venturi Meter.

Canada, Department of Mines: Report on Salt Deposits of Canada and Salt Industry; L. Heber Cole: Results of Investigation of Six Lignite Samples Obtained from Province of Alberta; B. F. Haanel and John Blizard.

Institution of Civil Engineers (London): Name-index to Volumes LIX-CXVIII, Minutes of Proceedings.

Lea-Courtenay Co.: Centrifugal Pumps.

Municipal Engineers of City of New York: Proceedings for 1914.



National Board of Fire Underwriters: Regulations for Installation of Automatic and Open Sprinkler Equipments, 1915; Regulations for Installation of Blower Systems, 1915.

Railway Library and Statistics for 1914. Slason Thompson, Ed.

Second Pan-American Scientific Congress, to be held in Washington, December 27, 1915-January 8, 1916: Preliminary Program.

Water Works and Other Engineering Features of New York: Compiled for 34th Annual Convention of New England Water Works Association.

LIBRARY COMMITTEE.

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## NEW ENGINEERING WORK.

(Under this head a brief description of new engineering work contemplated or under construction will be presented each month. Engineers and contractors are requested to send descriptions of their work to the Secretary, 715 Tremont Temple, Boston, before 1st of each month.)

**Commonwealth of Massachusetts.**—METROPOLITAN WATER AND SEWERAGE BOARD. — *Water Works.* — The work of laying about 14 370 linear feet of 60-in. cast-iron pipe in Commonwealth Ave. between Prince St. and the Charles River in Newton is about 43 per cent. completed under contracts with Andrew M. Cusack, of Boston, and Charles A. Kelley, of Somerville.

The work on the granite masonry tower which is to enclose the new steel tank on Bellevue Hill, West Roxbury, is about 75 per cent. completed, under contract with John Cashman & Sons Co., of Boston.

*Sewerage Works.* — Work is in progress on Sections 105 and 106 of the Wellesley extension, and Sections 103 and 104 will be started shortly. It is also expected that the Deer Island outfall extension and the Malden River siphon will be constructed soon.

**METROPOLITAN PARK COMMISSION.** — *Charles River Reservation.* — Plans and specifications have been prepared, and it is expected to call for bids in the near future for bridge over the Charles River at North Beacon St., Boston and Watertown.

Plans and specifications are being prepared for bridge over the Charles River at Commonwealth Ave., between Newton and Weston.

Work of grading, surfacing and other work from Charlesbank Road to Brooks St., Newton and Boston, is in progress. Rowe Contracting Co., contractor.

Plans and specifications have been prepared and bids received for excavating channel of Charles River from Elm St. to Bleachery Dam, Waltham.

*Furnace Brook Parkway.* — Work of constructing parkway extension from Quincy Shore Reservation to Hancock St. is in progress. John Cashman & Sons Co., contractors.

Work of building reinforced concrete girder bridge across Blacks Creek, for Furnace Brook Parkway Extension, is in progress. Hugh Nawn Contracting Co., contractors.

*Mystic Valley Parkway.* — Work of excavating and dredging the channel of Aberjona River from Boston & Maine Railroad to Waterfield St. is in progress. Coleman Brothers, contractors.

*Revere Beach Reservation.* — Work of building reinforced-concrete shore protection of the bleacher form at Revere Beach Reservation is in progress. Coleman Brothers, contractors.

**DIRECTORS OF THE PORT OF BOSTON.** — Contracts have been awarded for dredging the channels specified below.

| Location.                                                                                 | Length.<br>Ft. | Width.<br>Ft. | Depth at |    | Estimated<br>Quantity.<br>Cu. Yds. |
|-------------------------------------------------------------------------------------------|----------------|---------------|----------|----|------------------------------------|
|                                                                                           |                |               | M. L.    | W. |                                    |
| Squantum & Wollaston Yacht Clubs,<br>Lawrence & Wiggin Wharf in Mystic<br>River . . . . . | 4 600          | 70            | 8        |    | 96 500                             |
| Malden Bridge in Mystic River . . .                                                       | 400            | 150           | 30       |    | 31 000                             |
| Pleasant Park Yacht Club, Winthrop .                                                      | 1 150          | 150           | 10       |    | 37 300                             |
| Orient Heights Yacht Club . . . . .                                                       | 120            | 100           | 6        |    | 15 000                             |
| Wessagussett Yacht Club, North<br>Weymouth . . . . .                                      | 1 100          | 30 to 100     | 6        |    | 15 700                             |
|                                                                                           | 260            | 100           | 6        |    | 4 750                              |

**Boston Transit Commission.** — *Dorchester Tunnel.* — Section E includes two single-track circular tunnels, which will extend from near the junction of Summer St. and Dorchester Ave. under



the Fort Point Channel and private property to a point near Dorchester Ave. between West First and West Second Sts., South Boston. The length of this section is about 3 200 ft., of which about 2 160 ft. is directly under the channel. Work is being carried on from a shaft in West First St., from which two circular shields are being driven northerly toward Summer St. under compressed air. The shield for the easterly tunnel, which was started first, is now under the channel and the westerly tunnel shield is under the coal storage yards east of Dorchester Ave.

Section H is located in Dorchester Ave. between Old Colony Ave. and Woodward St., and is about 2 200 ft. long. The structure is to be mainly of reinforced concrete, and consists of a single-span double-track tunnel to be built by the cut-and-cover method. The work also includes a pump well, an emergency exit, and sewer changes. Excavation at the southerly end has been finished for a distance of about 1 000 ft. and at the northerly end of the section near Old Colony Ave. for a length of about 500 ft. The tunnel has been completed at the southerly end for about 700 ft. and at the northerly end for about 300 ft. The T. A. Gillespie Co. is the contractor. The work under this contract was extended September 16 a distance of 420 ft. further to the south towards Andrews Sq., and operations on the extension will soon be started.

*East Boston Tunnel Extension.* — The finish of the stations of the East Boston Tunnel Extension is nearly completed. Work is progressing on the coverings over the stairways at Scollay Sq. near the head of Hanover St.

The final restoration of the pavement along the route of the East Boston Tunnel Extension is in progress under a contract with Coleman Brothers. The work includes granite block paving on a concrete base in Cambridge St., Bowdoin Sq., Green St., Court St., and Scollay Sq.

*Boylston Street Subway.* — Boylston St. between Arlington St. and Carver St. is being repaved with wood blocks on a concrete base. In connection with this work the Boston Elevated Railway Co. is relaying the old tracks and laying additional tracks in Boylston St. between Arlington St. and Park Sq.

They are also constructing in Boylston St. at the head of the subway incline, landing platforms for both inbound and outbound cars.

**City of Boston.** — PUBLIC WORKS DEPARTMENT, HIGHWAY DIVISION, PAVING SERVICE. — Work is in progress on the following streets:

|                  |                                       |                             |
|------------------|---------------------------------------|-----------------------------|
| St. Williams St. | from Dorchester Ave. to Auckland St.  | Concrete base.              |
| Orleans St.      | from Gove St. to Porter St.           | Concrete base.              |
| Bayswater St.    | from Saratoga St. to Austin Ave.      | Bituminous macadam.         |
| Ardent St.       | from Colberg Ave. to Belgrade Ave.    | Concrete base.              |
| Chapin Ave.      | from Mt. Vernon St. to Preston Rd.    | Bituminous macadam.         |
| Pelton St.       | from Park St. to the Parkway.         | Bituminous macadam.         |
| Augustus Ave.    | from Poplar St. to Clarendon St.      | Bituminous macadam.         |
| Schiller Rd.     | from Rockland St. to the Dedham line. | Bituminous macadam.         |
| Birch St.        | from Penfield St. to Dudley Ave.      | Bitulithic pavement.        |
| Poplar St.       | from Sycamore St. to Brown Ave.       | Artificial stone sidewalks. |
| Prince St.       | from Pond St. to the Arborway.        | Asphalt pavement.           |
| Dane St.         | from Holbrook St. to Orchard St.      | Asphalt pavement.           |
| Haslet St.       | from Amherst St. to Metcalf St.       | Bituminous macadam.         |
| Crandall St.     | from Augustus Ave. to Hillside St.    | Bituminous macadam.         |
| Dunlap St.       | from Washington St. to Whitfield St.  | Concrete base.              |
| Helen St.        | from Bernard St. to Talbot Ave.       | Concrete base.              |
| Lyford St.       | from Woodrow Ave. to Franklin Field.  | Bituminous macadam.         |
| Oakland St.      | from River St. to Rockdale St.        | Bituminous macadam.         |
| Peacevale Rd.    | from Norfolk St. to Dunbar Ave.       | Asphalt pavement.           |
| Leslie St.       | from Dix St. to Centre St.            | Asphalt pavement.           |
| Blue Hill Ave.   | from Talbot Ave. to Morton St.        | Artificial stone sidewalks. |
| Brunswick St.    | from Blue Hill Ave. to Normandy St.   | Concrete base.              |
| Highland St.     | from Hawthorne St. 130 southerly.     | Artificial stone sidewalks. |
| Lucas St.        | from Washington St. to Shawmut Ave.   | Concrete base.              |
| Public Alley 908 | from Mass. Ave. to Marlboro St.       | Brick block pavement.       |
| Public Alley 809 | from Batavia St. to Gainsboro St.     | Hassam block pavement.      |
| Public Alley 810 | from Public Alley 809 to 811.         | Hassam block pavement.      |
| Public Alley 811 | from Batavia St. to Gainsboro St.     | Hassam block pavement.      |

**The Fore River Shipbuilding Co., Quincy, Mass.,** has the following work in progress:

U. S. Battleship *Nevada*.

Ten submarine boats.

U. S. Torpedo Boat Destroyers *Tucker* and Nos. 63 and 64.

Two oil-tank steamers.

Two molasses steamers and a cargo vessel for the Cuba Distillery Co.

Two freight steamers.



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BOSTON SOCIETY OF CIVIL ENGINEERS  
FOUNDED 1848

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PAPERS AND DISCUSSIONS

This Society is not responsible for any statement made or opinion expressed in its publications

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THE FEDERAL VALUATION OF THE BOSTON AND  
MAINE RAILROAD.

BY F. C. SHEPHERD,\* MEMBER BOSTON SOCIETY OF CIVIL ENGINEERS.

(To be presented November 17, 1915.)

THE Act to Regulate Commerce became a law February 4, 1887. This law was amended March 1, 1913, by an Act which added a new section, to be known as Section 19a, which is the so-called and much discussed "Federal Valuation Act."

A careful study of this Act brings out the following:

*First.* That the Interstate Commerce Commission is required to investigate, ascertain and report the value of all the property owned or used by every common carrier subject to the Act to Regulate Commerce, and that the Commission is given full authority to employ such experts, assistants and examiners as shall be necessary in the carrying out of the valuation work.

*Second.* That the Commission is to make an inventory which shall list the property of every common carrier in detail and show the value thereof, and shall classify the physical property as nearly as practicable in conformity with the Classification of Expenditures for Road and Equipment as prescribed by the Commission.

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NOTE. This paper is issued in advance of the date set for its presentation. Discussion is invited, to be received by Edward C. Sherman, Editor, 6 Beacon Street, Boston, before January 10, 1916, for publication in a subsequent number of the JOURNAL.

\* Valuation Engineer, B. & M. R. R.

*Third.* That the Commission is to ascertain and report in detail as to each piece of property owned or used by every common carrier for its purposes as a common carrier, the original cost to date, the cost of reproduction new and the cost of reproduction less depreciation, and is to make an analysis of the methods by which these several costs are obtained and the reasons for their differences, if any.

*Fourth.* That the Commission is to ascertain and report separately other values and elements of value, if any, of the property of every common carrier.

*Fifth.* That the Commission is to investigate and report in detail and separately from improvements the original cost of all lands, rights of way and terminals owned or used for the purposes of a common carrier, ascertained as of the time of dedication to public use, the present value of the same and, separately, the original and present cost of condemnation and damages or of purchase in excess of such original cost or present value.

*Sixth.* That the Commission is to investigate and report separately the property held for purposes other than those of a common carrier and the original cost and present value of the same.

*Seventh.* That the Commission is to investigate and report upon the history and organization of the present and of any previous corporation operating such property; upon any increases or decreases of stocks, bonds or other securities in any reorganization; upon moneys received by any such corporation by reason of any issues of stocks, bonds and other securities; upon the syndicating, banking and other financial arrangements under which such issues were made, and the expense thereof; and upon the net and gross earnings of any such corporations. It is also to ascertain and report in such detail as may be determined by the Commission upon the expenditures of all moneys and the purposes for which they were expended.

*Eighth.* That the Commission is to ascertain and report the amount and value of any aid, gift, grant of right of way or donation made to every common carrier, or to any previous corporation operating such property, by the Government of the

United States or by any state, county or municipal government, or by individuals, associations or corporations; that it is also to ascertain and report the grants of land to every common carrier or any previous corporation operating such property, by the Government of the United States, or by any state, county or municipal government, and the amount of money derived from the sale of any portion of such grants and the value of the unsold portion thereof at the time acquired and at the present time; also the amount and value of any concession and allowance made by every common carrier to the Government of the United States or to any state, county or municipal government in consideration of such aid, gift, grant or donation.

*Ninth.* That the investigation shall show the value of the property of every common carrier as a whole and separately in each of the several states and territories and the District of Columbia.

*Tenth.* That the Commission is to report results to Congress at the beginning of each regular session until all the work is completed.

*Eleventh.* That every common carrier is obligated to furnish to the Commission any maps, profiles, contracts, documents, records, etc., which may be asked for, shall grant to the agents of the Commission free access to all its property and records, and shall fully coöperate with and aid the Commission in all particulars.

*Twelfth.* That upon the completion of the valuation the Commission shall thereafter keep itself informed of all extensions, improvements or other changes in the condition and value of the property of every common carrier, shall ascertain the value thereof and shall from time to time revise and correct its valuation.

It will be seen from the above that this is not a mere physical valuation, but that it is a valuation in detail of all property owned or used by every common carrier, subject to the Act to regulate commerce.

Such common carriers include all corporations or persons engaged in the transportation of oil or other commodities except water and except natural or artificial gas, by means of pipe lines



or partly by pipe lines and partly by railroad; all telegraph, telephone and cable companies performing interstate business; and, of course, every railroad company whose business extends from one state into another.

There have been many discussions as to the reasons for this valuation Act and what the probable results would be. Just what was in the mind of Congress is, of course, not definite, but it appears from various recommendations which have been made to Congress from time to time by the Interstate Commerce Commission, and which were doubtless the controlling force in securing the enactment of this Act, that the valuation was essential —

(a) To obtain a trustworthy estimate of the relation existing between the present worth of railroad property and its cost to its proprietors;

(b) In determining whether rates as fixed by the Government are confiscatory;

(c) In connection with railway taxation;

(d) In the ascertainment of a proper depreciation reserve;

(e) In testing the accuracy of the balance sheets of the carriers;

(f) To the organization of railway statistics in general;

(g) In determining whether the railroads are under or over capitalized.

The valuation is a national valuation, but the law requires it to be made by state lines. When completed there will be not only a federal valuation of all interstate railroads and other common carriers, but a state valuation, which will probably supersede and supplant every other state valuation which can be made.

There is no more important practical question before the people of this country to-day than the treatment which should be accorded to their transportation facilities by rail. The valuation now being made is one of the most important factors in the decision of that question.

We have, first of all, the fundamental primary question as to whether the Government will take over these agencies of transportation, or whether it will suffer them to be conducted

for private profit. At the basis of this question lies the further question, of what is the value of these properties, and it is not supposed that the people of the country will ever come seriously to the discussion of government ownership until they first know what is the value of the railroads and what is the relation of that value to their capitalization.

If the railroads are to be left in private hands we have the still more important question of what treatment shall be accorded to the private capital which has been invested in them; for that treatment must be such as will not only do justice to the property which is there, but such that will attract other capital to that same sort of investment. The federal valuation is bound to be the basis of the determination of this question, and it will be the basis of the rates fixed by the Interstate Commerce Commission, and the main basis of the rates which will be fixed by the various states.

The magnitude of the work as regards railroads can best be appreciated with the knowledge of the following:

On June 30, 1913, the railroads of the United States comprised approximately 250 000 miles of line, which, with double tracks, yards and sidings, approximated 376 000 miles of track. The capital securities of these companies which were outstanding in the hands of the public at that time amounted to approximately \$15 000 000 000, of which, roughly speaking, 60 per cent. was bonds and other forms of indebtedness, and 40 per cent. stock, the latter being owned by over 620 000 stockholders. The number of employees was 1 815 000, their compensation aggregating \$1 373 000 000. During this same year the railroads paid in taxes over \$120 000 000.

For the undertaking of this immense work the Interstate Commerce Commission has organized a Division of Valuation, under the charge of Mr. Charles A. Prouty as director. Mr. Prouty had been a member of the Interstate Commerce Commission for many years and resigned from the Commission to take over this work. The director has, to assist him in carrying on the valuation work, besides counsel, an advisory board, an engineering board; a supervisor of land appraisals, a supervisor of accounts and a cost bureau.

For the purposes of the valuation the United States has been divided into five districts.

The Engineering Board is composed of five engineers. While the Board as a whole has direction of all the engineering features connected with the valuation, each member is directly in charge of one of the five districts. This Board outlines all the methods to be pursued and details to be carried out looking towards the obtaining of the detailed lists of the physical property other than lands, as noted in the second paragraph of the study of the Act. The Board will also complete for the physical items the cost of reproduction new and the cost of reproduction less depreciation.

The Supervisor of Land Appraisals has charge of the ascertaining of the present value of all railroad lands. He is assisted by five valuation attorneys, each attorney being directly in charge of a district.

The Supervisor of Accounts has charge of the investigation of the history and organization of every railroad and also of all financial investigations called for in the Act, and in addition to this the working out of the original cost to date. He is assisted by five valuation accountants, each accountant being in charge of a district.

The Cost Bureau is at work making investigations and collecting data for use in preparing the unit prices which will be used by the Engineering Department, after they have made their inventory, for the working up of the cost reproduction new. In addition to making such investigations themselves, the bureau has called on the railroad for a great deal of information which will be described later on under Order No. 14.

When the Act became a law, the railroads of the United States, recognizing the magnitude of the work to be done, knowing that they were to participate and realizing that it was for the interest of all concerned to have the work done as correctly as possible and all proper facts ascertained, organized a Presidents' Conference Committee as a central body to represent all the railroads. Every railroad was invited to join this conference, and at the present time it is supported by 215 000 miles, or approximately 86 per cent. of all the railroads in the United States.



Mr. Samuel Rea, president of the Pennsylvania Railroad, is general chairman of this committee, and Mr. Thomas W. Hulme is general secretary of this and all the other committees.

For the actual work, the railroads have separated into three groups, Eastern, Western and Southern, each group having its presidents' committee.

There is also a board of counsel associated with the Presidents' Conference Committee.

To handle the various details, separate group committees were appointed, one for engineering, one in connection with lands, and one in connection with the studies of financial histories and accounts. These various committees meet both separately and together. Each engineering committee has a group office in charge of a group engineer. All these committees have been continuously at work since their inception and have accomplished a great deal in the interests of the railroads. Every feature which has come up has been thoroughly discussed by them and then in turn with the Division of Valuation representatives. They have presented a great deal of data to the Valuation Division and have taken active part in the preparation of the various orders made by the Commission, and at the same time have kept the railroads in the country continuously advised of every step which has been made towards the working out of the methods of the valuation.

In addition to this, the State Public Service and Railroad Commissions have taken an active interest in the Federal Valuation. Their national organization has followed the matter, and with special committees the states have been represented at all the conferences between the Valuation Division and the railroads, and at such meetings have taken active part in presenting their views and suggestions. In some of the actual inventory work the State Commissions are represented in the field. Undoubtedly they will ask that the railroads file with them similar records to those which are filed with the Interstate Commerce Commission, and they will, of course, take more active part as the work proceeds, looking towards the final establishment of values.

At the beginning there was considerable discussion as to just how much detail work should be done by the Commission,

and how much they should require from the railroads. The Act calls for the Commission to make an inventory of the property of each common carrier. It was finally decided by the Division of Valuation that, in order to know that the units in their inventory were correct, they should obtain these units themselves. This is being done, but the valuation work as a whole is so divided under present arrangements that the Commission and the railroads are doing about an equal amount. The parts to be done by the railroad are specified in orders made out by the Division of Valuation and issued by the Interstate Commerce Commission. The first order was issued February 1, 1914, and to date twenty have been issued. These are as follows:

- Order No. 1. Specifications for maps and profiles.
- Order No. 2. Abandoned property.
- Order No. 3. Regulations to govern the recording and reporting of all extensions and improvements or other changes in physical property of every common carrier.
- Order No. 4. Inventory of materials and supplies.
- Order No. 5. Modifying and supplemental order to Order No. 1.
- Order No. 6. Regulations modifying and supplementing valuation Order No. 1.
- Order No. 7. Order and instructions pertaining to schedules of lands.
- Order No. 8. Regulations to govern the recording and reporting of register of equipment and original cost to date of same.
- Order No. 9. Order regarding transportation of employees, supplies and cars of the valuation division.
- Order No. 10. Modifying and supplemental order on abandoned property.
- Order No. 11. Order and instructions pertaining to an inventory of records.
- Order No. 12. Order for listing industrial tracks.
- Order No. 13. Order regarding inventory and schedules to be made by carriers.

- Order No. 14. Order and instructions pertaining to purchases of materials, prices paid and rates of compensation paid for labor.
- Order No. 15. Order and instructions pertaining to privileges given and leases made by steam railroads.
- Order No. 16. Order and instructions pertaining to aids, gifts, grants and donations.
- Orders Nos. 17 and 18. Order and instructions pertaining to purchases of materials, prices paid and rates of compensation paid labor pertaining to telegraph and telephone companies.
- Order No. 19. Order and instructions pertaining to purchases of material, prices paid and rates of compensation paid for labor pertaining to telegraph and telephone property of railroads.
- Order No. 20. Order covering corporate history of railroads.

All these orders either have specified dates on which they shall be complied with, or are so written that the director can specify the dates at his discretion. In the beginning the dates were uniform for all railroads, but modifications have been made, and where the carrier is not able to meet these dates extensions have been granted by the Division of Valuation, if they were convinced that the carrier was making a proper effort toward complying with them.

Order No. 1 obligates every steam railway carrier to file with the Commission maps and profiles of its entire system as it existed June 30, 1914, and specifies in detail just what is to be shown on each map and profile. The maps are all to be of a definite size, 23 in. x 55 in. inside the border, with a scale of 100, 200 or 400 ft. to one inch, each map to contain not more than one, two or four miles between match marks for the adjacent sheets. These maps are to be in much detail and are to show a complete survey of the railroad with all existing struc-



tures; survey stations and details of alignment are to be shown, and also each individual parcel of land which the railroad owns, with a table giving full information as to the acquisition of each parcel. All profile sheets are to be made 10 in. x 55 in. inside the border and on standard Plate A, with a scale of 1 in. equals 20 ft. vertical, and 1 in. equals 400 ft. horizontal. These profiles are to show the railway grade line with all rates of grade and changes, the original surface of the ground at the center line and all bridges, culverts and other information which may be available. It is estimated that to comply with this order the Boston and Maine Railroad will have to make about 3 000 maps and 750 profiles. Moreover, we are obligated to file all such maps and profiles with the Government on tracing cloth, either original tracings or reproductions.

Order No. 2 prescribes that each carrier shall file with the Commission complete and detailed schedules of all fixed physical property abandoned prior to June 30, 1914, together with a complete and detailed statement of claims with respect thereto. These schedules are to show the property acquisition in accordance with the investment accounts, are to give physical units of the property with the original cost of same to date of abandonment, date of abandonment and disposition and present status of abandoned property. Maps, profiles and other records may be requested by the Commission.

Order No. 3 specifies a standard form by which, beginning with the date of valuation, the carriers are to furnish each year to the Commission a complete statement of all extensions and improvements or other changes in the physical property. This is required so that the Commission will have the necessary information to revise the valuation from year to year.

Order No. 4 instructs every steam railway carrier to make as of June 30 each year an inventory of materials and supplies carried in stock.

Order No. 5 modifies the date of filing of maps called for in Order No. 1.

Order No. 6 modifies Order No. 1, in that it decreases somewhat the amount of detail to be shown on plans of any carrier having less than one hundred miles of main line and

roadway, and gross earnings of operation of less than \$3 000 per mile.

Order No. 7 calls for a typewritten schedule giving full information regarding each parcel of land owned or used by the carrier. There are two forms accompanying this order, one for lands used for purposes of a common carrier, and the other for lands held for purposes other than those of a common carrier. Each parcel is to be as recorded on the maps in Order No. 1, and in addition to the acquisition records the railroads are obligated to show the area and original cost of every parcel of land which they now own.

Order No. 8 calls for a register of all equipment and a detailed statement of the original cost to date of each piece of equipment. The following kinds of equipment are classified:

- |                                |                              |
|--------------------------------|------------------------------|
| 1. Roadway machines.           | 7. Freight train cars.       |
| 2. Shop machinery.             | 8. Passenger train cars.     |
| 3. Power plant machinery.      | 9. Motor equipment of cars.  |
| 4. Power substation apparatus. | 10. Floating equipment.      |
| 5. Steam locomotives.          | 11. Work equipment.          |
| 6. Other locomotives.          | 12. Miscellaneous equipment. |

Accompanying the order are standard forms which are to be filled out, these forms to be typewritten in duplicate and filed with the Commission.

Order No. 9 provides for transportation of Government employees, and covers charges to be made for transporting supplies, equipment and outfit cars which these employees are using on the work.

Order No. 10 modifies the date of the filing of schedule of abandoned property called for in Order No. 2.

Order No. 11 prescribes forms on which a typewritten inventory shall be made of all principal records, documents and papers in the possession of the railroad, this covering the records of the directors and stockholders, ledgers, journals, cash books, security records, construction records, rail records, bridge records, annual reports and other miscellaneous records.

Order No. 12 prescribes a form on which the carrier shall furnish a typewritten schedule of every industrial track; that

is, each track which the carrier has not an unrestricted right to use in serving the public. This record calls for the location of the track, the length, map number, and any agreements which may be in existence in the carrier's records regarding same.

Order No. 13 gives the director authority to instruct any carrier to prepare and file a complete inventory of quantities, units and classes or kinds of property, other than that called for in Orders 7 and 8.

Order No. 14 calls for schedules showing purchases made and prices paid during the last five or ten years for practically all the various kinds of materials which are used by a railroad. It also calls for a schedule of rates of compensation to employees for the last ten years. Accompanying this order are 87 forms, each for a different kind of material, which are to be filled out by the carrier, giving complete information of purchases, freight, etc.

Order No. 15 instructs the carrier to file a summary statement, for the fiscal year ending June 30 next preceding the date fixed by the Commission as that on which the carrier's property shall be valued, of money received from other carriers for use of any property, except equipment, and money received from other than carriers for use of carrier property. It also furnished a form on which is to be shown a schedule of all leases of land claimed by the carrier to be owned for its purposes as a common carrier, with some minor exceptions.

Orders Nos. 17 and 18 apply to telegraph and telephone companies.

Order No. 19 is similar to Order No. 14, in that it requires a schedule list of all purchases made by every carrier for material which is used in connection with telegraph and telephone work. There are thirty-four forms accompanying this order, which are to be filled out on the typewriter.

Order No. 20 calls for a complete statement of all facts of every corporation, company or firm at any time connected with the railroad. This information has to show the name of every corporation, date of incorporation, date of organization, description, amount constructed, length of time actually operated, and date of beginning and date of conclusion of such operation.



It also prescribes a form for a chart which will show all this information in great detail.

The first start towards valuation work on the Boston and Maine Railroad was made in November, 1913, when the president appointed a valuation committee. This committee at first consisted of three members but was later increased to seven. At the first meeting of this committee, which was held on November 20, 1913, Mr. A. B. Corthell, chief engineer, was elected chairman, the writer appointed valuation engineer, and Mr. M. C. Bradley appointed valuation accountant.

At that time no active work had been started by the Commission and only the Engineering Board had been organized for the actual work. The Board had held quite a number of joint meetings with the Railroad Engineering Committee, working out details covering the plans to be required and the methods to be followed in obtaining physical inventory.

We first started a careful study of the history of the Boston and Maine Railroad. The present system is composed of some one hundred and seventy original corporations, the first of which was chartered in 1796. Under reorganizations, purchases and consolidations, there are now forty existing corporations, all of which are either owned, leased or controlled by the Boston and Maine.

Having the corporate ownerships as now existing we next made a study for a schedule of inventory or valuation sections. We were confronted with the fact that the valuations are to be made by state lines, and that, for our own records at least, we should make the valuation sections agree with existing corporations. We have therefore made the valuation sections as a whole by corporate ownerships, although there are some parts where the ownerships were so extensive or diversified that we have given more than one section to a corporation. At the present time we have sixty valuation sections, for each of which separate inventories and collections will be made. With all these corporations there are six common carriers under the Act, for which valuations will be made by the Commission. These are as follows:

Boston and Maine Railroad.

York Harbor and Beach Railroad Company.

The Sullivan County Railroad.

Vermont Valley Railroad.

Montpelier and Wells River Railroad.

The St. Johnsbury and Lake Champlain Railroad Company.

The second, third and fourth of this list are operated by the Boston and Maine as agents, while the last two, although controlled by the Boston and Maine, are operated independently.

On January 16, 1914, we were advised that the Boston and Maine Railroad was one of the first roads on which valuation work would start, and that actual field work would be commenced about May 1. The date fixed for the valuation of the Boston and Maine Railroad is as of June 30, 1914.

Originally, the Interstate Commerce Commission was of the opinion that all carriers in the United States should be valued as of the same date. After following the matter carefully, they decided that this could not be very well done, and consequently the various roads are being valued as of different dates.

On February 1, 1914, Order No. 1 was issued, following which our Valuation Department was organized. We first made a careful study of what plans were in existence on our entire system so as to determine which of them could be made acceptable to the Commission for filing under Order No. 1. A careful study revealed the fact that on our system of some 2 500 miles there were in existence maps, of various sizes, and mostly on a scale of 1 in. equals 100 ft., for about 1 000 miles, which it appeared could be brought up to date without complete field surveys. For the other 1 500 miles we found that complete new resurveys would have to be made.

We started in the office making tracings, in accordance with the Government regulations, from the existing maps, and to complete these maps started small parties of two men each over our lines, obtaining the data necessary to complete the plans; such as survey station points for turnouts, structures, etc., locations and dimensions of culverts, fences and buildings and other miscellaneous items, all of which would have to be placed on the maps before they could be filed with the Government.

For this work four parties of two men each, under the charge of an assistant engineer, completed the 1 000 miles in the field between February 16 and December 11. As fast as the field work was done, the information obtained was placed on the tracings in the office.

For the new survey work, parties were started in the field in February, 1914. A gradual increase in the number of parties was made until nine parties were at work, and have been continuously to date. Up to September 1, 1915, these parties had completed resurveys for 1 250 miles of line and an entire resurvey of the Boston terminal, and it is anticipated that the entire work will be done by December 1, 1915. These parties are composed of four field men and one draftsman, three parties being under the direct charge of an assistant engineer. The field draftsman travels continuously with the survey party, and completes and forwards to the main office a plan which shows all existing features, survey stations, offsets and other information, or a complete detailed resurvey of our line. These plans are inked in on mounted paper in rolls containing approximately seven miles on a scale of 100 ft. to the inch.

The speed of these parties varies with the character of the line on which they are working, there being some locations where on account of congestion, number of tracks, etc., they will not cover more than half a mile a week, while on other lines, where the conditions are much different, we have had some parties cover seven or eight miles a week. The average throughout is approximately three miles a week for each party.

All these parties find their own subsistence, using for the most part passenger or freight trains to go back and forth from where they are living to the place at which they are working. We have, however, in some instances, used motor cars, and find that where such a car has been used we have increased our work at least two miles a week, this condition, of course, applying to lines where the railroad stations are few and far apart.

On this work we are using duplicate field note books, by which a carbon copy is obtained of all the work. By doing this the draftsman always has a copy of the field notes the day after they are taken. We find that by keeping the field plans in close



touch with the field survey work we reduce corrections and the picking up of omissions to a minimum.

As fast as the field plans are received in the main office they are laid out for the Government sheets and the tracings made. A draftsman in the office can complete such tracings at the rate of two to three a day. For all the tracings we purchase the cloth cut to size, with the border lines printed thereon. For the title work we are using a Golding printing press. In the press, instead of type, we are using plates which are reproductions of the lettering of one of our draftsmen. With the press and the plates we are able to put titles on our maps at a cost of about one and one-half cents each, and at the rate of about two hundred in four hours.

Where we have made resurveys we are painting the rail at every 100-ft. station, and noting the station at 500 or 1 000 ft. intervals, this being done to aid in the taking of profiles where necessary, and also for the assistance of the Government engineers in their chaining. Up to the present time we have made no start on profile work. It is hoped that instead of the profiles, as called for in Order No. 1, we can substitute our regular track charts, which, while on a much larger scale, give a more comprehensive idea of the rise and fall of the grades, and which we think would be much more suitable for use in working out valuation than that called for by the map order.

Our next step is the working up of the land lines and land records called for in Order No. 1, and it is this work which we find is the most difficult and takes the most time. At the start we found that there was practically no part of our system on which the land records were complete, and that there was a large proportion of our system on which no land maps were in existence. We have therefore found it necessary to reproduce on our plans all the land lines for the entire system. It can readily be seen what it means when it is realized that the purchase of the lands covers a period from about 1830 to date, and that there are about 25 000 land parcels to be located. It can also be realized that, as many of the original corporations are non-existent and have passed through so many hands during the different reorganizations, many records have been lost.

While our men in the office use the deeds which are in the possession of the railroad, many deeds are missing, and our Land Commissioner has for over a year had his assistants going to every registry point in New England and part of New York State obtaining a record of every deed in the name of any railroad which has ever been a part of our system. After checking this record against the deeds we have, abstracts are then made of the missing ones. Beyond this the Commissioner is obtaining copies of all county commissioners' awards and all locations as filed for all the railroads. We find, even with all this information, that there are many places where we can get no records of ownership of parts of our right of way. At these points, of course, we will be obliged to fall back on the fact that the railroad is there and in possession. Such records will undoubtedly be accepted by the Commission.

After making up the plans in accordance with Order No. 1 we are starting on Order No. 7. For this order we are obliged to show on the form called for, besides the information above shown in the plan, the areas and the considerations shown in the deed for all the land parcels. These forms are then handed to the valuation accountant, who will work up the information regarding the original cost of every parcel. This means a tremendous amount of work, as it will entail going over all the original records which can be found and obtaining from these records information regarding every voucher by which payment was made for every parcel of land. Further than this, we are to find, and of course it is to our advantage also, any information possible regarding expense incurred in each acquisition. It will, of course, be absolutely impossible for us to find such information in many instances. Many of the old records are gone, or lost by fire.

The physical inventory is obtained from an actual survey of conditions as of to-day. It is perfectly obvious that many conditions which existed at the time the railroads were built cannot be shown or found to-day and that in such an inventory the railroads therefore would lose many items which should be used in the reproduction cost. This question has faced the railroads since they first started on this work. In order to

reduce such a loss as much as possible we first issued the following circular letter:

### BOSTON AND MAINE RAILROAD.

BOSTON, MASS., February 25, 1914.

#### *To All Concerned:*

In connection with the Valuation of the Boston and Maine Railroad, which is about to be started by the Government, it will greatly aid the Railroad, and perhaps be of considerable ultimate gain, if any person having any information regarding note books, plans, or any other records which are not on file in the various head offices, or if any of the older employees can give any specific information regarding difficulties met with during the construction of the various parts of the road, or any conditions which required unusual expense, such information will be gladly received and greatly appreciated, if reported to Mr. F. C. Shepherd, valuation engineer, Boston, Mass.

All books, papers or documents relating to the financial or corporate history of the various roads now in the system, should be reported to Mr. M. C. Bradley, assistant to the general solicitor, Boston, Mass.

It should be understood that any information requested by parties in the Valuation Department should be freely given.

#### VALUATION COMMITTEE,

A. B. CORTHELL, *Chairman.*

E. J. RICH.

S. H. MCINTOSH.

This circular was sent all over our system and posted in all offices and yards with the hope that it would reach the eye of some one who had in his possession old records or information, or who could tell us where they thought such information could be obtained. The responses from this circular were quite gratifying. From it we have located many old records, plans and note books which were not known to be in existence. We have also received a great deal of information by letter. To handle this feature of the work we organized a small squad for hidden research. It was the duty of some of the members of this squad to interview those from whom letters had been received, and finally we started some of them walking the line, interviewing everybody who had any knowledge of any part of the railroad. All the information which was obtained was placed on index cards. Moreover, all the note books and plans

that we could find were collected. In addition to this the valuation accountant has had a squad of men at work getting for us all information regarding quantities on the many large improvements and grade-crossing separations made since the railroad was originally constructed. All the information so obtained is furnished to the pilots for their use as they go over the various parts of our system.

To assist in describing the inventory features, I have divided them into three departments, engineering, lands and accounts.

### ENGINEERING.

As noted above, the engineering features for the Commission are handled by the Engineering Board, one member of which is in charge of each district. This member has under him a district engineer, who in turn has under him senior field engineers who have direct charge of the inventory of track and roadway, a senior structural engineer who has charge of the inventory of bridges for the entire district, a senior architect who has charge of the inventory of all buildings for the district, a senior signal engineer who has charge of the inventory of all signals and interlocking in the district, a senior telegraph engineer who has charge of all inventory of telegraph and telephone lines in the district, a senior mechanical engineer who has charge of the inventory of all equipment and machinery in the district, and a senior electrical engineer who has charge of the inventory of all electrical equipment in the district. For the guidance of the men actually in charge of the work, printed instructions have been issued by the Engineering Board covering these various branches, copies of which are given to the railroads for their information.

The first Government track and roadway party started on the Boston and Maine Railroad on April 29, 1914. Other parties were added, so that during the year 1914 there were five such parties at work. The work here was suspended during the winter months and these parties transferred to the South. They returned here again in April, and during this year six parties have been at work. Up to the present time, 1 900 miles



have been covered by these parties, and it is anticipated that all the track and roadway inventory work will be completed on the Boston and Maine by December 15.

All these parties are under the charge of a senior field engineer, with headquarters in Boston. Each party is under the charge of an assistant engineer. These parties usually comprise nine men, — the assistant engineer, three cross-section-men, three recorders and two computers. The cross-section party is taking cross sections of our roadbed so as to obtain all the grading quantities which go to make up the present cuts and fills. The number of sections taken depends, of course, on the conditions as actually found. Practically all of the cross-section work has been done with a Lock level and a tape, although there are times when a "Y" level has been used, and some experiments have been made with special cross-section instruments. As yet these instruments have not been generally adopted, although in one of the districts the so-called "Beeman arc" has been used. The cross sections when taken are plotted directly into note books in the field, and usually on a scale of 1 in. equals 10 ft. On each section is shown the distance out and the distance down, with the center of the track and the base of the rail being assumed as zero; for all changes in the section the original ground surface at the base of fills or edge of cuts is noted. The original surface where removed is plotted by judgment. No elevations are taken. When the sections are being made, the classification is shown on them. Each day the cross-section notes are turned over to a computer, who works up the area of each section by use of a planimeter, and transfers the areas to a quantity diagram. This, in reality, is a mass profile, from which the quantities of each cut and fill can be obtained directly by planimeter. The diagrams when finished are sent to Washington, where they will be used in connection with the necessary computations for overhaul. Ballast depths and sections are taken for each cut or fill and deducted or added to the cross sections, depending on whether the cross section is an embankment or a cut. Ballast depths are found by digging, and for this the railroad furnishes the labor.

The recording party chains the line and makes a complete

inventory of features other than grading and ballast. The weights of the rails are noted; the ties, rail braces, tie plates and anti-creepers are counted in two 600-ft. blocks for each mile, from which an average is obtained for the entire mile; all culverts are measured and dimensions noted; all information at turnouts is obtained, with a notation for each part, such as the switch, frog, guard rail, etc.; a record is made of all signs and fences; bridges up to 16 ft. span are inventoried; the result being a complete inventory of all the parts which go to make up the track and roadway, outside of ballast and grading. All computations and collections of this information are made in the office by a computer, and for each mile or track plan as made by us. The computers in the office collect all this by accounts and work up all quantities.

When the work was first started the ordinary type of note book was used, with a complete running sketch being made of the entire road, and from this the computations were made. As the work proceeded, however, developments were made of a type system, by which the various items are typed by letter or number. With the aid of these and special field forms, much better progress is made and a much better inventory obtained. At the present time these field parties average about  $2\frac{1}{2}$  miles a week.

With each party we have placed an engineer, who is called a "pilot," and office computers. It is the duty of the pilot to represent the railroad and to cooperate with the Government engineer, and to point out all unusual conditions or hidden quantities of which we may have record, these records usually being on the cards which were noted above. He agrees with the field engineer on the grading classification and the depth of ballast. The computers are at work with the Government computers checking their computations.

At first these parties found their own living along the line where they were working. The computations were made in whatever rooms we could furnish, or in the rooms in which the men were boarding. To keep the work better centered and have a place where all the men could work, especially in rainy weather, we are now furnishing field office cars. For this work we have

taken an old passenger car or a caboose car and fitted it up with long tables for the men to work on. At the present time the Government field men, instead of living on the country, are using their own cars. These are Pullman cars which have been purchased and rebuilt by the Valuation Division, with accommodations for some fifteen men, a cook and an attendant being furnished for each car. The men sleep and eat in these cars, the railroad moving the cars from point to point as requested by the field engineer.

In going over the first parts of our line, we found many of the fills built on salt marsh or fresh-water swamps, and while there was no evidence of settlement or any signs of mud-waves created by the fills, we felt that there must be a considerable subsidence, if it could be located. To find this we finally adopted the use of wash boring machines. Our fills are, in the most part, made of sand or gravel, and with these wash boring machines we found that we could readily locate the line between the bottom of the sand and gravel and the top of the original peat or marsh. Two machines have been used each year and the work inspected by the Government engineers. During the two years with these machines we have located over 2 000 000 yds. of fill beyond that found by the original cross sections.

In the conferences held between the Engineering Board and the Engineering Committee of the railroads, prior to the starting of actual field work, there were discussions as to how the railroads could check the Government work, and requests from the railroads that they be given copies of the Government notes for use in checking the quantities and in completing their plans. The final outcome of this was a circular issued by the director, to which he attached the form of an agreement which he was willing to have executed between the Division of Valuation and any railroad. By this agreement the Valuation Division agreed to give to any carrier signing it, carbon copies of all field notes taken by the track and roadway party, with the understanding that the railroad would accept these notes as correct, provided no objection was made within thirty days. This agreement was executed by the Boston and Maine Railroad, and we have at all times received carbon copies of all the field inventory notes.

Although this agreement was limited to the track and roadway notes, we have since made arrangements by which carbon copies of all notes and computations made by all the engineering parties are given to us. We are carefully checking the computations, with the result that at the time the inventory is completed we shall be in agreement on the physical quantities as located and enumerated.

The work in connection with inventory of bridges and buildings was started in October, 1914. For these parties both the Government and the railroad furnish one engineer and one computer. Our representative is furnished with copies of all the bridge or building plans which we can find in our files and also information regarding the construction, weights of superstructures and specifications if necessary. The bridge party visit in turn every bridge of over 16 ft. span as they travel along the line, and take sufficient measurements to identify the plans or records which they may have or to compute all quantities in case no plans or quantities are in existence. The building party performs the same work in connection with buildings. For the buildings sufficient measurements are taken so that the cubical contents of each building can be figured, and sufficient notations are made as to the kind of construction of the building as will be necessary in making an appraisal of the building. In the buildings, records are taken of all furniture and fittings other than stationery. The line between the building and the track and roadway party is usually drawn at the building wall, although the building party do take the platforms and awnings, drains directly connected with the building, and in some instances have taken the features outside the building, such as driveways, shrubbery, etc. For our own records we are also taking photographs of each building. Up to the present time these parties have covered some 800 miles, and hope to finish our line some time during the winter. In order to make more speed, we have furnished a motor car for the use of the bridge and building party as it travels over the line. We have recently, also, put on an additional building party which is taking the buildings at the large junction points or terminals.

The signal and interlocking party started late in October,



1914. In the party there are two representatives from the Valuation Division and a pilot from the railroad. This party is taking all measurements necessary for the working up of the various quantities for all automatic signals, crossing and warning signs and interlocking towers. This party has completed some 700 miles to date, and will undoubtedly finish during the winter.

The Valuation Division is also at work making an inventory of the Western Union Telegraph Company, and at the same time making an inventory of the telegraph and telephone property of the Boston and Maine Railroad. For this work we have no representative and have arranged that the representative of the Western Union Telegraph Company look after the railroad's interests. On this work we are receiving carbon notes of the parts owned by us. The work is practically completed.

In all the work of the track and roadway, bridge and building, signal and interlocking and telegraph and telephone parties, no attempt has been made toward fixing the depreciation, although this has been done in some of the other districts. The Government engineers are, however, making careful notations regarding the condition of the various parts as they find them, and on the bridges and buildings have made some attempt towards fixing the service life which can be expected from the various parts of the structures. It is anticipated that the depreciation, or the condition percentage, will only be obtained after a careful study of all maintenance records and operating conditions, and by traveling over the lines with a special train with the proper representatives of the railroad and the Valuation Division.

Order No. 8 was received early this spring. Since that time the Valuation Accountant has had a considerable force employed working up the register for the various items called for in this Order. This registry is most exhaustive. For locomotives, passenger cars, shop machinery, etc., the register has to show a complete history of every individual unit. For freight train cars these can be grouped by series. From a study of one of the register blanks it can be readily seen what an amount of work this entails.

The actual field inspection of equipment by the mechanical

engineer has recently been started, and work is now under way on the inventory of locomotives, cars and shop machinery. For each of these classes the Valuation Division has an inspector, and with him we have placed a pilot, one of our master mechanics for locomotives, our general car inspector for cars, and one of our superintendents of shops for the shop machinery. It is the intention of the Valuation Division to make an actual inspection of every locomotive, every passenger car, 10 per cent. of each series of freight cars and all shop machinery. For the engines and cars a printed form is used, part of which will be filled out from the register, and part from the inspection in the field. In addition to this, after a careful inspection of each unit, the two representatives are agreeing on the maintenance of the unit; as to whether it is normal, above normal or below normal, the normal referring to the maintenance as regards our standard of maintenance, and also as regards the age of the unit.

We are also at work obtaining from our records information regarding every car or engine retired for the last fifteen years. From this it is expected that we can obtain sufficient data as to the average service life of these units. We are also endeavoring to get records from which we can obtain the average mileage which should be expected of a locomotive between shoppings. From all this information the remaining service life or condition percentage of each unit will be obtained. The field inspection for mechanical equipment will be completed this year.

No work has as yet been started by the electrical engineer, but we expect that it will be begun during the next few weeks. The same procedure will pertain to this as to the mechanical equipment.

#### LANDS.

As noted above, the land work for this district is under the direct charge of the valuation attorney. For the actual field work he is being aided by assistant attorneys and by senior and junior appraisers.

As fast as we finish the land maps for a valuation section, prints are turned over to the valuation attorney. In June, 1914, actual field work was started on the land valuation. The first

work in the field is the establishment of zones of land of similar character; that is, our right of way is divided into zones, each zone depending on the character of the adjacent and adjoining lands. In some places the zones are continuous, where the character of the land is similar on both sides of the right of way, but where there is a distinct difference on either side, the zones are sometimes carried along the center of our right of way. These zones are established by actual inspection of the line.

The appraiser next visits the assessors' offices in the district where the railroad is located, and obtains from their records the assessed values of all the adjoining or adjacent lands, noting the comparison between the assessed and the actual values. He then obtains records of all bona fide sales in the locality which can be substantiated, and finally visits representative men, usually real estate men, in the various localities, and obtains from them their opinions of the actual value of these adjoining and adjacent lands. From all this data the appraiser makes his estimate of the normal market value of the adjacent and adjoining lands, which is the so-called basic value to be used in the valuation of our right of way lands. What the next procedure will be has not yet been determined by the Valuation Division.

The railroad land committees have had this question under consideration for a long while. They have asked from all the roads any information which can be given on recent acquisitions, divided so that it would show what the railroads have to pay above the normal market value for consequential or sequence damages, and also the acquisition costs. This information will be compiled and filed with the Valuation Division so as to give to them a record of what might be expected in the acquisition of new railroad lines, and information which the railroads think should be used in the fixing of the values of the rights of way as now owned.

It is ordinarily estimated that the land values of a railroad represent about 30 per cent. of its value. This would mean approximately a five-billion dollar (\$5 000 000 000) investment for lands by the railroads of the United States, and from this one can readily judge the importance of this subject. Just how the final values will be fixed is, of course, unknown, but it

is one of the parts of the valuation which will probably lead to the greatest discussions.

The Boston and Maine Railroad, through its land commissioner, has its own representatives at work compiling basic values for use in checking the Government figures. Up to the present time there has been no real coöperation between the Division of Valuation and the railroads on land values. Various schemes have been proposed by the railroads for such coöperation, and the Director himself has expressed himself very strongly in favor of some method of coöperation, but has stated that it is his opinion that the opinions obtained from local parties should be found separately. It is still hoped that some coöperative method will be found so that a large part of the future discussions or differences may be eliminated.

As noted in the discussion of the Act, there are two kinds of land: land owned or used for the purposes of a common carrier, and land held for purposes other than those of a common carrier. Such distinctions have to be shown on the land plans called for in Order No. 1 and on the form filled out in Order No. 7.

The question of lands held for purposes other than those of a common carrier is quite a delicate one, and has lead to many discussions. Various instructions have been issued by the Commission toward the fixing of a definition of carrier land, and instructions have been issued by the railroad land committee to all the railroads giving their opinion regarding it. There are yet some classes of land concerning which there is considerable discussion. At the present time the Government appraisers are working under instructions which state that the real criterion of whether the land is held for carrier purposes is whether there is any immediate prospect of such land being put to actual railroad use.

#### ACCOUNTS.

As noted above, the accounting work for this district is under the direct charge of a district accountant. The work here is being handled by an accountant, who has under him quite a number of assistants. The first accounting work in connection with valuation of the Boston and Maine Railroad was started



by the Government in May, 1914. An attempt was first made to work out the original cost to date of the original Boston and Maine corporation. This corporation was chartered and construction work started in 1835. The accountants were given all books or records which we had in our possession and started to make up the original cost to date, using the present classification and accounting system. After considerable time had been spent on this work the accountants came to the conclusion that from the records available they would not be able to in any way make up such an original cost. This work was then dropped.

Since that time they have been at work on the financial history of the Boston and Maine Railroad. They have attempted to work up full detail of all stock and bond issues, and also to show where all the moneys coming from such issues have been used. They have also made a careful investigation of all operating accounts, endeavoring here to work up a complete statement of all the operating earnings and where all these earnings have been used, as, for instance, operating expenses, additions and betterments, retirements, dividends, etc. It is estimated that up to the present time they have completed perhaps one half of the work which they are to do.

There has been considerable discussion as to whether original cost to date could be ascertained or not. Director Prouty in a speech made before the National Association of Railway Commissioners, in Washington, on November 17, 1914, stated that the valuation accountants had endeavored to work up original cost to date on several railroads so as to ascertain just what might be expected. He stated that one of the instances where this had been done was on the Texas Midland Railroad, which is a road 120 miles long, where the books began about twenty-one years ago. It cost the Government \$133 a mile to do the accounting work on the Texas Midland necessary to work out the original cost to date, and it was the opinion of the director that all the work involved in obtaining the original cost to date of this railroad is absolutely thrown away. There are cases where original cost can be found on certain items, and at a joint conference held last May the director put the question before the railroads and the states, as to whether an estimate

should be made where records were not available. To this the railroad reply was, that in case of isolated structures such estimating might be well done, but that as a whole they did not think that it should be so made. The reply of the State Commission to this answer was that the original cost to date should be obtained, no matter how.

This briefly represents the present condition of the valuation work on the Boston and Maine Railroad, and is fairly typical of the work which has been started on various other roads in the United States. On some of these roads the inventory of the physical property has been completed, and in one or two instances preliminary reports have been made on these roads showing the cost of reproduction new and the cost of reproduction less depreciation. In these reports, however, no values were placed on the lands or on any of the contingent items, but just the mere inventory of physical property.

The Division of Valuation is now at practically its maximum development, and it is expected that all the field work and investigations will be completed for the entire country in five years. Just what the valuations will be, or how they will be determined, cannot, of course, be stated. Congress instructed the Commission to investigate many things, and then from this to state the value. It is probable that the many different investigations were called for because of the fact that there are so many theories as to valuation, and it is evident that Congress desired the Commission to investigate all these various theories before fixing their final values.

At the present time, important conferences are being held. A conference was held in May between the railroad representatives and the Division of Valuation at which many of the most important items were discussed and a brief filed by the railroads which was answered by the State Commissions. A further conference was held before the Interstate Commerce Commission itself on September 30, at which time the railroads filed a brief giving their ideas and contentions on the main features of valuation, and giving much data supporting these ideas. The principal parts of the brief cover the questions of depreciation, land values, other elements of value, contingencies, unit

prices, joint facilities, and theories on which reproduction new should be based. It is not my intention to enter into any discussion on these general subjects.

The cost of this work, both to the Government and to the railroads themselves, has been widely discussed. The work on the Boston and Maine Railroad will consume over two years, possibly three, during which time a maximum organization of 130 will have been actively at work. We estimate that the cost to the railroad will be at least \$100 per mile and probably more, and that the cost to the Government will be at least an equal sum. The cost on other roads will vary, depending upon the conditions, some more and some less, but it is anticipated that at least \$100 per mile will be expended by all the railroads in the country, and that the Government will probably spend a similar amount. This will make the total cost of valuation approximately \$50 000 000.

Many questions have been asked as to the accuracy of the inventory of the physical property. We have always found that the Government engineers are anxious to arrive at as correct results as can be obtained, and it is probable that the errors in the parts that can be readily seen will be small. In the grading and masonry, however, there are many chances for loss. No one knows how thick or how deep many of the masonry walls or abutments are, or what may be under them. For the grading, the original surface of the ground is always a matter of guess. A comparative test was made last year by the Delaware and Hudson Company, on the cross-sectioning of a part of their line. One party made cross sections, using first the Lock level, second the "Y" level, and third using a transit and level. It was found that the same party doing the cross-section work by these various methods obtained practically uniform results, but that when a second party did the work, using the same methods, their results were uniformly alike, but differed from the results obtained by the first party. In other words, the mere personal element shows much variation in results obtained. It is then evident that with all the care that can be taken, there is liable to be a considerable loss to the railroads on some items such as grading and masonry.

valuation work are shown on the following pages. — EDITOR.]

[illegible]



## D. V. FORM NO. 311.

DATE..... INTERSTATE COMMERCE COMMISSION

FIELD SHEET NO.....

INITIALS.....

CARRIER..... DIVISION OF VALUATION  
54—PASSENGER TRAIN CARSFOR CARRIER  
FOR I. C. C.

STATION..... STATE.....

Builder.....; date built.....; owner's plate.....

Bought of.....; date bought.....; kind of car.....

History.....

## IDENTIFICATION.

- |                                                          |          |
|----------------------------------------------------------|----------|
| 1. Capacity, passengers.....; pounds.....; weight.....   | 28. .... |
| 2. Length over end sills..... width over side sills..... | 29. .... |
| 3. Body, kind.....                                       | 30. .... |
| 4. Roof, kind.....                                       | 31. .... |
| 5. Underframe, kind.....                                 | 32. .... |
| 6. Body bolsters, kind.....                              | 33. .... |
| 7. Body cross-ties, kind.....                            | 34. .... |
| 8. Air brake equipment schedule.....                     | 35. .... |
| 9. Trucks, kind.....                                     | 36. .... |
| 10. Truck bolsters, kind.....                            | 37. .... |
| 11. Wheels, No.....; kind.....; diam.....                | 38. .... |
| 12. Journals, size.....                                  | 39. .... |
| 13. Axle generator, kind.....; volts.....                | 40. .... |
| 14. Batteries, kind.....; No. of cells.....              | 41. .... |
| 15. Draft rigging, kind.....; maker.....                 | 42. .... |
| 16. Platform, kind.....                                  | 43. .... |

|                                         |     |
|-----------------------------------------|-----|
| 17. Vestibule, kind .....               | 44. |
| 18. Partitions, No. ....; kind.....     | 45. |
| 19. Toilet rooms, No. ....              | 46. |
| 20. Toilet hoppers, No. ....; kind..... | 47. |
| 21. Interior finish .....               | 48. |
| 22. Seats, No. ....; kind.....          | 49. |
| 23. Upholstering, kind.....             | 50. |
| 24. Light, electric .....               | 51. |
| 25. Heat, kind.....; maker.....         | 52. |
| 26. ....                                | 53. |
| 27. ....                                | 54. |

## GENERAL CONDITION AND DEFECTS.

[illegible]

D. V. FORM NO. 308.

DATE ..... INTERSTATE COMMERCE COMMISSION ..... PAGE.....  
 FIELD SHEET NO. .... DIVISION OF VALUATION ..... LOCOMOTIVE NO. ....  
 CARRIER ..... 51—STEAM LOCOMOTIVES ..... INITIALS .....  
 STATION ..... STATE ..... FOR CARRIER .....  
 FOR I. C. C. ....

Builder.....; builder's No. ....; date built.....; owner's plate.....  
 Bought of.....; date bought.....; service.....  
 History.....

## IDENTIFICATION.

|                                                    |                                                  |
|----------------------------------------------------|--------------------------------------------------|
| 1. Type, Whyte symbols .....                       | 18. Boilers, type .....                          |
| 2. Size of cylinders .....                         | 19. Boilers, diameter at first ring .....        |
| 3. Diameter of drivers over new tires .....        | 20. Fire box, type .....                         |
| 4. Tender capacity, water.....; fuel.....          | 21. Fire box, dimensions.....                    |
| 5. Engine truck wheels, kind.....; diameter.....   | 22. Combustion chamber.....                      |
| 6. Driver brakes, kind.....                        | 23. Flues, No.....; O. D.....; length.....       |
| 7. Driving wheel centers, kind.....; diameter..... | 24. Tender, type.....                            |
| 8. Superheater, kind.....                          | 25. Tender frame, kind.....                      |
| 9. Main steam valves, kind.....                    | 26. Tender wheels, No.....; kind.....; diam..... |
| 10. Valve gear, kind.....                          | 27. Tender trucks.....                           |
| 11. Air reservoir, No.....; size.....              | 28.....                                          |
| 12. Air pumps, No.....; make.....                  | 29.....                                          |
| 13. Air pumps, S or C.....; size.....              | 30.....                                          |
| 14. Air brake equipment schedule.....              | 31.....                                          |
| 15. Headlights, No.....; kind.....                 | 32.....                                          |
| 16. Train signal, kind.....                        | 33.....                                          |
| 17. Working steam pressure.....                    | 34.....                                          |







## MEMOIRS OF DECEASED MEMBERS.

### ALEXIS H. FRENCH.\*

OUR fellow-member and past-president, Alexis H. French, died at his Brookline home early Monday morning, May 3, 1915. He had quietly celebrated his sixty-fourth birthday a few hours before, and his sudden death was a great shock to all about him.

Mr. French's death, while sudden, was not altogether unexpected. He was a victim of arteriosclerosis which brought him premature old age in a few months and ended in a painless sleep which had no waking.

Last autumn, he was obliged to give up his full participation in public affairs and attend to only such matters as were brought to him from time to time. During the fall and winter he hoped and planned to resume his usual duties, but early this year, at his request, he was given leave of absence from the first of March without pay.

Mr. French had been town engineer since the establishment of the Engineering Department by the town in 1894. Prior to that time he had done the larger part of the public engineering work since he came to Brookline in 1871, thus making an enviable and nearly unbroken record of service of forty-four years.

Mr. French was born May 2, 1851, at North Weymouth, Mass. His parents were Henry J. and Lucy H. (White) French, and he leaves, in addition to his wife, a brother, D. Willis French, a water-works engineer of New York, and widowed sister, Mrs. John Libbey, of Weymouth.

The education afforded by the Weymouth High School was supplemented by the purchase of an apprenticeship in the office of Shedd & Sawyer, of Boston, at that time one of the

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\* Memoir prepared by Edward W. Howe and Henry F. Bryant.

best-known engineering firms of the country. Not fully satisfied with the amount of definite instruction received in this way, he took a position in 1871 as assistant to Mr. George Tyler, then acting for the Town of Brookline as engineer and superintendent of streets. He later entered the Massachusetts Institute of Technology as a special student, associated with the class of 1873, successfully spending there two detached years, which was all the time he felt he could afford.

On the retirement of Mr. Tyler in 1875, Mr. French was given an office in the Brookline Town Hall, which he shared for some time with the superintendent of streets. In consideration of the use of this office, special reduced rates were fixed for services furnished the town, and both public and private business was conducted there. This arrangement continued until 1894, when the salaried office of town engineer was created and Mr. French was appointed.

On January 14, 1880, he married Miss Alice Blanchard Loud, of Weymouth, and not long after built their home on the corner of Cypress Street and Cypress Place. There are no children.

Mr. French was identified with the greater part of the material development of Brookline. He saw the town grow from a population of 8 000 to one of 30 000. Except for the initial work on the main outlet sewers, the entire sewerage and drainage system of the town was constructed under his direction. This is underground and largely forgotten. It nevertheless represents a large expenditure and involved many difficulties which have been successfully overcome.

The park and playground system, with but few minor exceptions, was installed and maintained under the direction of Mr. French. This is a visible and constantly appreciated monument to the skill with which his own and the designs of others have been carried out at reasonable expense and in permanent form.

The stone arches across Muddy River and its branches, from Carlton to Chestnut streets, were nearly all designed in his office and were all built under his direction. They are examples of the best of taste. The Longwood Avenue arch, when

built, was one of the longest spans in this country and is a favorite subject for artists and photographers. The construction of this bridge was modestly described by Mr. French in a paper presented to this Society.

The laying out of new bridges, new streets, and the widening of main thoroughfares has also been a large part of the work of Mr. French in both his private and public capacity. The grade-crossing eliminations at Washington and Cypress streets, the several widenings of Boylston and Hammond streets, were among the important items.

Alongside of the matters mentioned, there has been the great mass of minor public matters which really make up the major part of the professional work of a municipal engineer. This incidental work was steadily increasing for many years, due to the modern tendency to make of the municipal engineer the technical executive of all public affairs. Mr. French's ripe experience and wide observation made his judgment valuable and in constant demand.

The title of town engineer indicates but slightly the importance and extent of Mr. French's work. Brookline as a town is unique in having what is probably the largest population of any municipality retaining the old New England form of town government, and, moreover, in having the valuation and consequent activities of a city several times its size. Such a condition required engineering service of high order.

Mr. French was a member of numerous social, technical and quasi-public bodies, viz., the American Society of Civil Engineers, the Boston Society of Civil Engineers, the Engineers' Club, the Appalachian Mountain Club, the Massachusetts Highway Association, the National Geographic Society, Harvard Church and Brotherhood, the Boston Congregational Club, the Brookline Historical Society and the Technology Alumni Association. He was active in the affairs of many of these bodies, as is evidenced by his holding the office of president in our own Society in 1900-1901, having served as vice-president for the two preceding years. He was also a past-president of the Appalachian Mountain Club and was one of its trustees of real estate at the time of his death.



In 1874, he joined the Harvard Congregational Church, and has since been an active worker in its interest, being president of the Brotherhood at one time and for a long time member of the Prudential Committee.

Mr. French joined this Society in 1874, at the time of its rejuvenation, and was one of about a dozen who now represent our oldest membership. His interest in the affairs of the Society has been constant and took a final concrete form in the provision of his will, leaving \$1 000 to the Society, the income to be devoted to the library.

In 1894, when appointed town engineer, he formed a partnership with one of his assistants, under the name of French & Bryant, by which firm all private professional business was conducted until he withdrew his name in 1908. From the time of his appointment as town engineer, Mr. French devoted all his time to public affairs and none whatever to private business. Nevertheless, to remove all possible misunderstanding, he thought it wise to sever his connection with the latter.

About the year 1890, Mr. French took up photography as a recreation, and practiced the art with his usual care and success until recently. The number of his pictures was smaller than for most amateurs, but his successes were more numerous and his failures few. His collection of mountain views made for the Appalachian Mountain Club, and other views presented to his friends, is worthy of great praise for its execution and its taste.

By thrift and good management of his affairs, rather than by unusual income, Mr. French accumulated a considerable property, particularly in real estate. Such a result should be gratifying and inspiring to all engineers, especially if it be accompanied, as in this case, with the honor and love of his fellow-men.

No citizen of Brookline ranked higher than Mr. French for kindness and for integrity and devotion to public and private duty. His methods were quiet and unostentatious, were absolutely above political or personal influence, and they contributed much toward the enviable reputation of the town for simple, unbiased and efficient administration of public affairs.

## BENJAMIN GREELEY FOGG.\*

BENJAMIN GREELEY FOGG was born in Gorham, Me., March 11, 1881. He received his preparatory education in the public schools, graduating from the Newburyport High School in 1902. In 1902 he first entered the Massachusetts Institute of Technology. In 1904 he entered the United States service as civil engineer with the Philippine Civil Government. He served abroad from March, 1904, to July, 1906, being chiefly engaged on topographical survey work and highway construction.

In 1906 he returned to the United States and re-entered Technology, but was obliged to relinquish his studies there on account of poor health. The next year he accepted a position as instructor of civil engineering in the Pennsylvania State College for a while, but returned to the Institute and completed his course, receiving the degree of S.B. in 1908 and resuming teaching in the Pennsylvania college the same year.

In 1909 he became connected with the Aberthaw Construction Co. of Boston, being at first employed on construction work in Maine and shortly afterwards entering the Boston office of the company, where he assisted in developing their system of cost accounting.

In 1913, on physician's advice, he sought outdoor employment and was transferred to the field work of the company, in which he continued in New Hampshire and Maine until shortly before his death, which occurred on March 14, 1915, at Newburyport, Mass.

He was married in 1908 to Miss Katherine E. Knight, who, with a daughter, survives him.

Mr. Fogg was esteemed and liked by all who came to know him. He was of a kindly disposition, not easily ruffled, and ready with help to all his associates. To his associates, both in his painstaking work in the developing of the somewhat intricate system of cost accounting in the Boston office, and in its practical application in the field, his loss is greatly felt. They all know that by his untimely decease they have lost a valued fellow-worker and a real friend.

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\* Memoir prepared by Leslie H. Allen and J. A. Garrod.

## ISAAC RICH.\*

ISAAC RICH was born in Brookline, Mass., on October 6, 1856, and died March 11, 1915. He suffered from angina pectoris for a long time, but the final end came to him suddenly at his home, 36 Walnut Street, Somerville, Mass.

He was the son of the late Thomas and Maria L. Rich, of Brookline; and a descendant of Richard Rich, of England, who came to the Colonies, and first settled for a while at Dover, N. H., and in 1680 moved to Eastham, Mass., on Cape Cod. His parents moved to Boston when he was three years of age, and all the associations of his boyhood and early manhood were with the South End. He was graduated from the Boston English High School in 1875, and was in the class of 1878 at the Massachusetts Institute of Technology.

During the working years of his life he has been employed as a civil engineer, and for the greater part of the time on railroad construction. During the Institute vacation term of 1877, he was employed from June to October as a rodman on the surveys of the Boston, Hoosac Tunnel & Western Railroad between Hoosick Falls and Mechanicville, N. Y. From August, 1878, to June, 1879, he was employed as rodman and leveler on the line of the Atchison, Topeka & Santa Fé Railroad through the Royal Gorge and Grand Canyon of the Arkansas in Colorado, working under Mr. Joseph O. Osgood, C.E., a former resident of Boston.

Returning to Boston, on June 11, 1879, he secured a position as leveler with the New York & New England Railroad, under Mr. L. B. Bidwell, chief engineer, and was stationed at Danbury, Conn. There he was associated with Mr. D. G. Penfield, division engineer, on the construction of the part of the main line from Danbury, Conn., to Towners, N. Y., and remained on that work until December, 1880, when the construction was practically finished. In a few days he started West again, having accepted a position as division engineer on construction of the California Southern Railroad, under his former employer, Mr. Osgood, who has then chief engineer.

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\* Memoir prepared by George T. Sampson, F. B. Rowell, and T. P. Perkins.

He was soon after promoted to the position of resident engineer and had supervision over four divisions covering about 58 miles of the 126 miles between San Diego and Colton, Cal. He continued in this position until June, 1882, when he again returned to his home and friends in Boston.

He was then again employed on the New York & New England Railroad as an assistant engineer until August, 1885, being meanwhile engaged on a great variety of work: preliminary lines, estimates and the construction of coaling stations and similar works, necessary for the maintenance and development of a growing railroad property. In the summer of 1883 he worked on the preliminary surveys from Allyn's Point to Groton, Conn., for an extension of the Norwich & Worcester Railroad, which was afterwards built in 1898. He personally made the plans, profiles and estimate of cost.

His next employment was with the Napa Consolidated Quicksilver Mining Co. at Oak Hill, near Calistoga, Napa County, Cal., where his position was that of assistant superintendent and accountant, which he filled from August, 1885, to September, 1888. He was also engineer on the property and had much to do in the construction of roads, railroads, new water supply and rebuilding of furnaces, as well as in making underground surveys and surveys of the land and mining claims. As additional duty, he kept the accounts and purchased supplies.

He was then employed for a third time with the New York & New England Railroad for the four years following October, 1888. His most important work at this time was as assistant engineer of the Suburban Railroad, a subsidiary corporation which was chartered for the purpose of building a line from Cook Street near Newton Highlands on the Woonsocket Branch to a connection with the main line of the New York & New England Railroad at Dorchester. It was a project which in one form or another had been under consideration for many years, and there was much to be said in favor of it at that time. He made the field surveys, and advanced the work to the making of the final location and plans, sufficient to have started construction had the conditions proved favorable.

His next employment was with the Boston & Maine Rail-



road from September, 1892, to April, 1895, as assistant engineer and division engineer, on the lines between Springfield, Mass., and Sherbrooke, P. Q., and on the St. Johnsbury & Lake Champlain Railroad, with office at St. Johnsbury. While there he reported to Chief Engineer Bissell. He was also employed for a short time at Boston in charge of general engineering work on the southern and eastern portions of the Boston & Maine system.

From April, 1895, until the close of his active years, he was employed with the New York, New Haven & Hartford Railroad on that part of the system which was the original Old Colony Railroad, as assistant engineer in the office of the division engineer at Boston. He at first worked with Mr. George S. Merrill, division engineer, and later with his successor, Mr. J. W. Pearson. During this term the growth and expansion of the railroad system was rapid and continuous, and the work on which he was engaged had all the variety and interest which falls to the lot of a civil engineer in railroad practice both on new construction and on maintenance. He was personally employed on work for the elimination of grade crossings at Harwich; at Buzzards Bay; at Norton Furnace; at Rockland Street, Hingham, and at Main Street, North Falmouth, Mass. He handled dock work at Newport and Fall River; the extension of second track, and the building of new stations at many places on the division.

On May 10, 1912, he was obliged to resign his position on account of ill-health, and passed his remaining years quietly at his home in Somerville.

He became a member of the Boston Society of Civil Engineers, April 16, 1890, and of the American Society of Civil Engineers in 1903.

In 1889 he married Miss Alice Montague Vinal, daughter of the late Robert A. and Almira L. Vinal, and since then made his home in Somerville at the Vinal homestead, corner of Walnut and Aldersey streets. He leaves a widow, a brother, Henry Rich, and a sister, Mrs. John A. E. Hussey, both of the latter being residents of Brookline.

Mr. Rich was unassuming in his manners, of quiet deport-

ment, genial and kind in his disposition, a man of the true type. He was methodical in business affairs, prompt and punctual in all his appointments, regular and upright in conduct, of fair fame and good character. He gave his best service to his employer, and was best contented when fully employed.

His interest centered in his work and his home.

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## BOSTON SOCIETY OF CIVIL ENGINEERS

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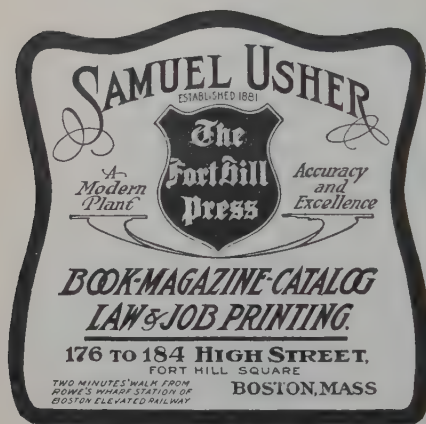
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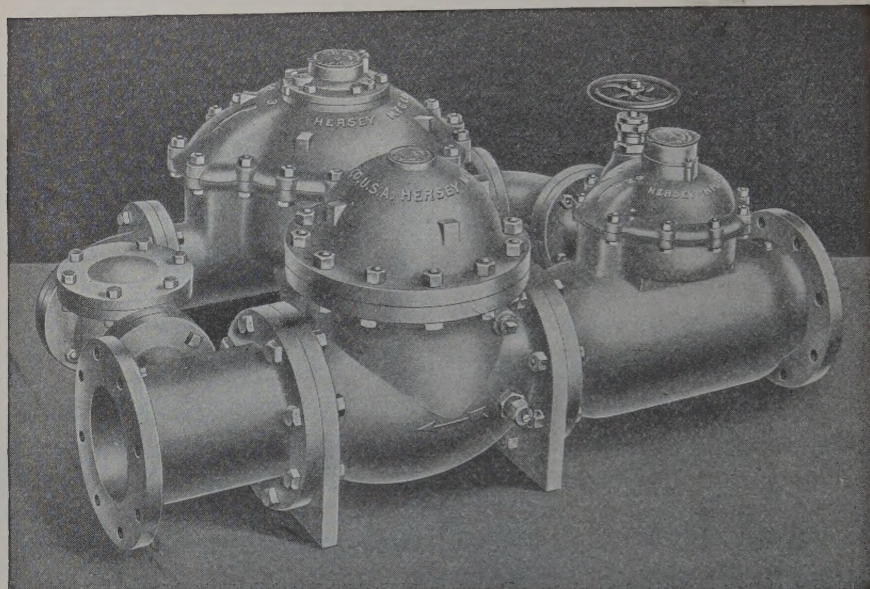
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